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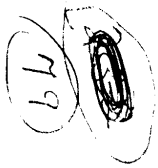
basic imagery interpretation report

Major Indian Space and Missile-Related Facilities (S)

MISSILE RANGES: STRATEGIC SSM/SPACE FACILITIES
BE: Various
INDIA



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Z-14092/84
RCA-15/0001/84
DECEMBER 1984
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INSTALLATION OR ACTIVITY NAME					COUNTRY
Major Indian Space and Missile-Related Facilities					IN
UTM COORDINATES	GEOGRAPHIC COORDINATES	CATEGORY	BE NO.	COMIREX NO.	NIETB NO.
NA	See Table 1	See Table 1	See Table 1	See Table 1	See Table 1
MAP REFERENCE					
Various sheets					
LATEST IMAGERY USED		NEGATION DATE (if required)			
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ABSTRACT

1. This report presents an overview on the major facilities related to the Indian Space/Missile Program. The report discusses the various space launch vehicles (SLVs) and describes the major facilities related to SLV research, development, production, testing, and operational launching. These facilities have the capability to support a strategic ballistic missile program. This report, which incorporates information acquired through [redacted] includes two location maps, an SLV comparison chart, and 20 annotated photographs. (S/WN)

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INTRODUCTION

2. The Indian Space Program, which is the responsibility of the Department of Space, was begun in the early 1960s in support of a United Nations (UN)-sponsored sounding rocket project. The UN wanted to establish an international equatorial sounding rocket launch facility for the peaceful exploration and use of outer space. India's bid to be the host country was approved and Thumba, near the southern tip of India, was chosen as the site for the launch facility.[1] The technology gained through cooperation in the UN project helped India establish its own sounding rocket program. An SLV program developed from this sounding rocket program and slowly evolved through the 1970s. India has successfully developed and produced satellites that were launched with an indigenous SLV. Currently two new SLVs, capable of placing much heavier payloads into orbit, are in the advanced stages of development.[2] Support and launch facilities for these new SLVs were also under construction. (S/WN)

3. The Ministry of Defense is responsible for military missile programs. Until this year, the only Indian military involvement in a missile program was with small tactical missiles. Although no specific military application of the SLV technology has been seen on imagery, an Indian government source indicates that India has initiated research into modifying their existing SLV for military use.[3] India has facilities capable of producing strategic ballistic missiles. [redacted]

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Facilities

4. The major facilities related to research, development, production, and launching of Indian SLVs are in central and southern India (Figure 1 and Table 1). The headquarters for the space program is in Bangalore, while research and development (R&D) of military missiles is centered in Hyderabad. Major engineering for the development of SLVs and satellites and their scientific applications is accomplished at Bangalore, Ahmedabad, and Thumba. The largest space center in India is on Sri Harikota Island, which has facilities for launching and tracking SLVs and for manufacturing and testing rocket motors. The major facilities involved in R&D and manufacture of solid propellants for rocket motors are at Alwaye, Thumba, Sri Harikota, Itarsi, Kirkee, Pune, Bhandara, and Hyderabad. The R&D of liquid propellant engines is conducted at Hyderabad, Thumba, and Sri Harikota. The R&D and production of missile guidance and electronic components are carried out at Hyderabad and Thumba. SLV systems integration and final assembly are done at Thumba and Sri Harikota. SLV flight tests and operational SLV launches are performed at Sri Harikota. (S/WN)

The Status of the Space Program

5. The objectives of the Indian Space Program are to develop the capability to launch indigenous satellites for a national telecommunications system and to assist in meteorological and other remote sensing applications.[2] India's first attempt to launch an SLV, the SLV-3, ended in failure on 10 August 1979. A successful launch was achieved on their second attempt on 18 July 1980. Two subsequent SLV-3 launches were successful, one in 1981 and one in 1983. Although the last three space launches were successful, complications unrelated to the SLV later arose with the satellites resulting in only limited success. India has also had three of its satellites launched by the Soviet Union and one each by the United States and the European Space Agency. The success of these five satellites, launched between 1975 and 1982, has also been limited.[4] (U)

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Table 1. Major Indian Space and Missile-related Facilities (S)

Installation Name	Geographic Coordinates	Category	BE Number	COMIREX No	NIETB (MRN) No
Bangalore Space Missile Research Organization	13-00-45N 077-34-30E				
Hyderabad Missile Research and Development Facility DRDL	17-19-30N 078-30-00E				
Ahmedabad Space Applications Center	23-01-30N 072-31-00E				
Thumba Missile and Rocket Test Site VSSC	08-32-05N 076-52-03E				
Sri Harikota Space Center	13-43-20N 080-12-25E				
Alwaye Solid Propellant and Test Facility APEPE	10-05-30N 076-22-50E				
Sri Harikota Propellant Plant SPROB	13-47-30N 080-12-17E				
Itarsi Solid Propellant Production Complex	22-35-16N 077-53-00E				
Kirkee Ordnance Research and Development Facility ARDE	18-31-58N 073-48-17E				
Pune Explosives Research and Development Laboratory	18-31-32N 073-45-01E				
Bhandara Solid Propellant Production Facility	21-06-00N 079-34-00E				
Hyderabad Possible Bharat Dynamics LTD	17-19-40N 078-30-25E				
Sri Harikota Rocket Motor Test Facility	13-47-10N 080-12-20E				
Sri Harikota Space Launch Facility	13-39-54N 080-13-35E				
Sri Harikota Space Launch Facility North	13-43-15N 080-14-47E				
Ahmedabad Physical Research Laboratory	23-01-25N 072-33-50E				

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This table is SECRET/WNINTEL.

Launch Vehicle Characteristics

6. The SLV-3 is a relatively small, four-stage, solid-propellant SLV capable of launching a 45-kg payload into low earth orbit. Two additional SLV programs, the Augmented SLV (ASLV) and the Polar SLV (PSLV), which have been in the R&D phase since the late 1970s, will significantly upgrade India's capability to launch heavier, more sophisticated satellites (Figure 2). The ASLV will essentially be in the same configuration as the SLV-3; however, it will have two solid-propellant, strap-on boosters. The strap-on boosters were derived from the first stage of the SLV-3. The PSLV will be configured in four stages and have six solid-propellant, strap-on boosters. The first and third stages will be solid motors and the second and fourth stages will be liquid engines. The second-stage engine is based on French technology that is used in the Ariane SLV. The six strap-on boosters for the PSLV are the same type as those used for the ASLV.[2] Indian press releases indicate that the first launch of an ASLV will be in 1985 and that the first launch of a PSLV is scheduled for 1988. (S/WN)

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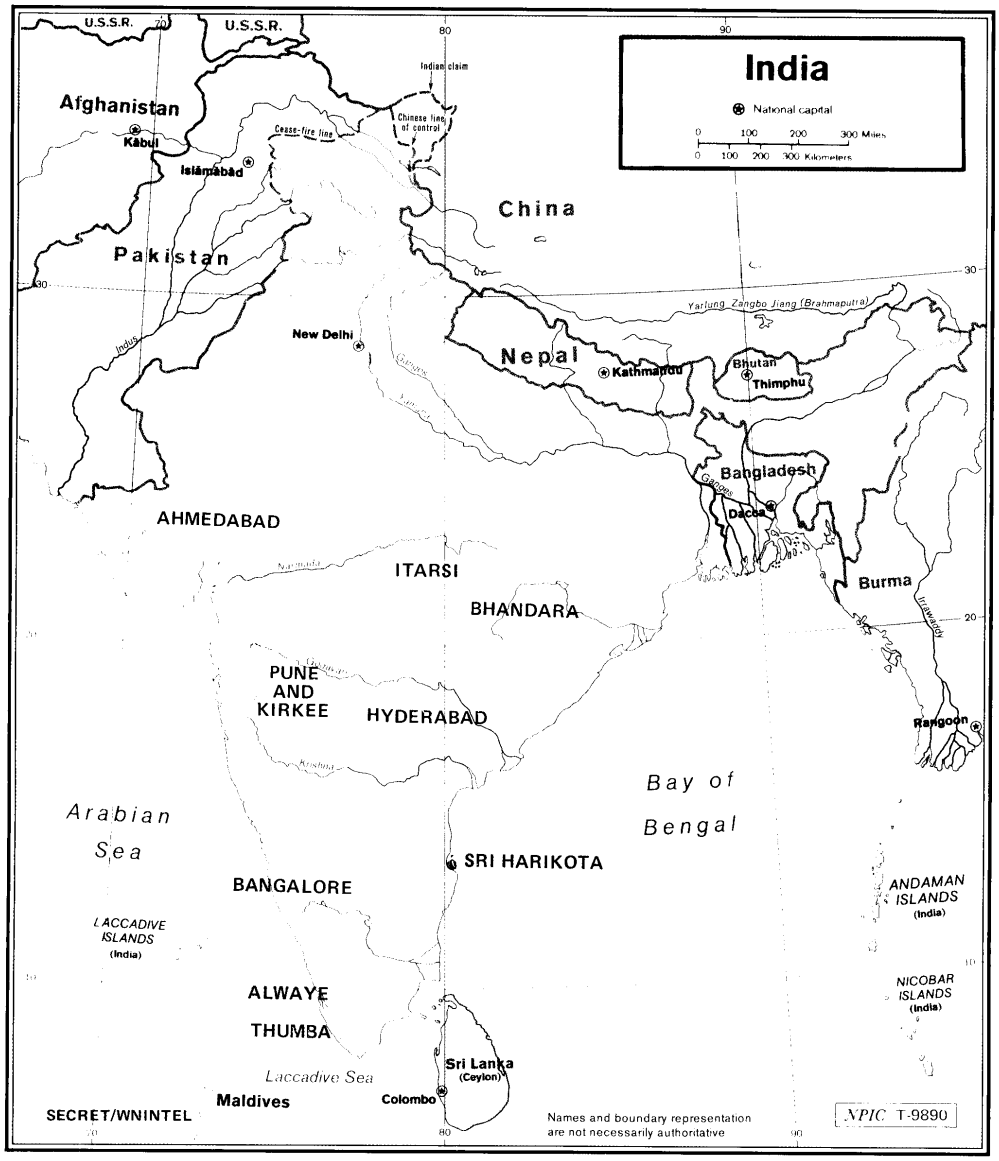

FIGURE 1. LOCATIONS OF MAJOR INDIAN SPACE AND MISSILE-RELATED FACILITIES

BASIC DESCRIPTION

Research and Development

7. Within the Department of Space, the Indian Space Research Organization (ISRO) has the responsibility for the overall management of the space program. The ISRO provides the overall guidance and direction in the fields of space science, technology, and applications for the space program. The ISRO headquarters is at Bangalore Space Missile Research Organization in southern India, about 5 nm northwest of the center of Bangalore (Figure 3). The manufacture of satellites and testing of antennas and other satellite components are carried out at this facility. The facility consists of six double-bay fabrication buildings, five shop buildings, one probable antenna test facility, two probable environmental test buildings, and several associated support buildings. (S/WN)

8. Major research for various scientific applications of the space program is conducted at the Ahmedabad Physical Research Laboratory (Figure 4). The facility contains at least 30 laboratory buildings, one probable fabrication/assembly building, numerous support buildings, and over 200 multiunit quarters. (S/WN)

9. Ahmedabad Space Applications Center (Figure 5), 1 nm southwest of the Physical Research Laboratory, is responsible for R&D of satellite and electronics systems and components for the space program. The center consists of a satellite communications earth station, a civil engineering area, an electronics systems area, a fabrication/assembly area, and a housing area. (S/WN)

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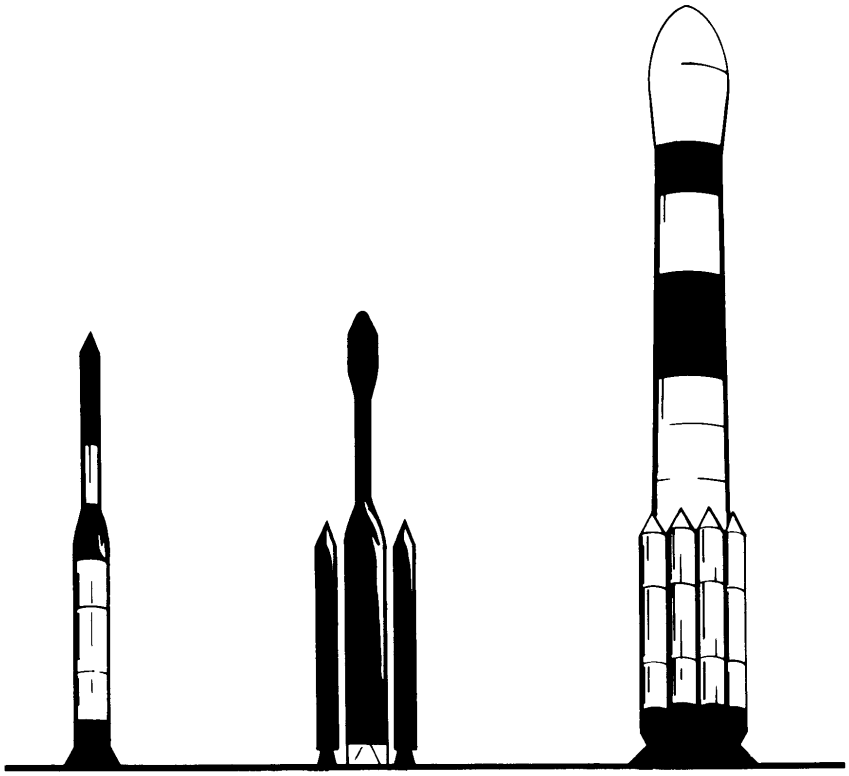

	SLV-3	ASLV	PSLV
Approx Payload Weight in Low Earth Orbit (kg)	45	150	1,000
No of Stages	4	4	4
No of Strap-on Boosters	0	2	6
Propellant	Solid	Solid	Solid & Liquid
Overall Size in Meters			
First Launch	1979	(1985)	(1988)

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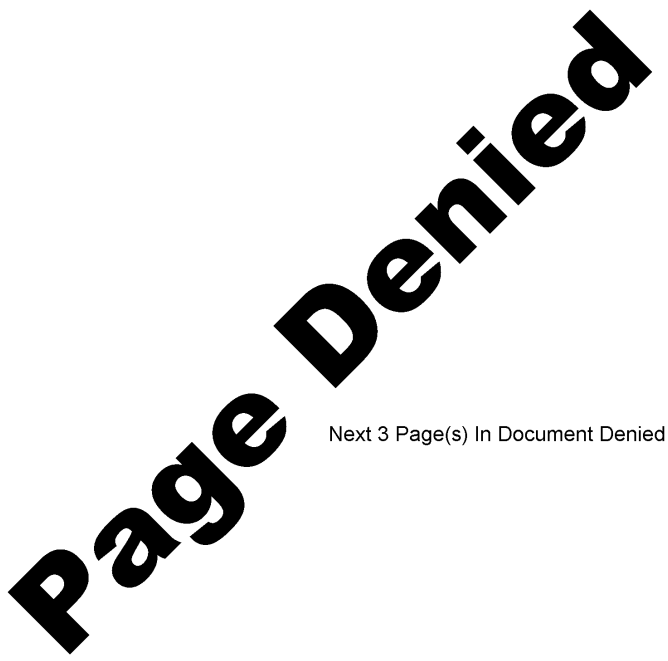
FIGURE 2. SIZES AND CHARACTERISTICS OF INDIAN SLVs



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10. The major Ministry of Defense R&D Center for Military Missile Programs is Hyderabad Missile Research and Development Facility DRDL (Defense Research and Development Laboratory; Figure 6). The DRDL has facilities for missile fabrication and for R&D and testing of solid (composite and double-base) and liquid propellants. It includes a hypersonic ballistic wind tunnel (Figure 7) and the largest liquid engine test stand in India (Figure 8). The DRDL consists of an administration/engineering and fabrication area, a probable fabrication area, a rocket motor propulsion R&D and static test area, and a propellant R&D and production area. (S/WN)

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11. The R&D and production of missile guidance systems and electronic components for the military are conducted at Hyderabad Possible Bharat Dynamics Limited (Figure 6). The plant, which also produces antitank guided missiles, consists of an assembly plant area, an administration/fabrication area, a storage area, and an explosives storage area. (S/WN)

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Propellant Production

12. Sri Harikota Propellant Plant SPROB (solid-propellant space booster plant) is responsible for production and nondestructive testing of solid motors for SLVs that use composite propellants (Figure 9). It appears to be capable of producing motors much larger than those at India's other solid-propellant production facilities. The plant at the northwest end of Sri Harikota Island, just off the southeast coast of India, about 45 nm north of Madras, consists of an administration area, a production area, a test area, and a support area. The production area has facilities for ingredients preparation, mixing, casting and curing, and finishing. The production area has recently been expanded, probably to accommodate production of the larger PSLV booster. (S/WN)

13. Alwaye Solid Propellant and Test Facility APEPE (ammonium perchlorate experimental plant) produces the ammonium perchlorate that is used as an oxidizer in the composite propellants in the SLV motors (Figure 10). This small pilot production plant consists of one large, multisection production building; one probable engineering/test building; two administration buildings; three support buildings; one cooling pond; one water treatment facility; and two probable acid storage tanks. (S/WN)

14. Bhandara Solid Propellant Production Facility (Figure 11) produces double-base solid propellants for India's military missiles. The facility consists of a double-base solid-propellant production area (with nitrocellulose and nitroglycerin production), a solid motor production and storage area, an explosives storage area, a rocket motor test area, and an administration/engineering area. (S/WN)

15. Itarsi Solid Propellant Production Complex (Figure 12) is nearly complete and will be capable of producing single-base solid propellants for artillery and missiles. This plant consists of a solid-propellant production area (with nitrocellulose production), an explosives storage area, a shipping and receiving area, an administration area, and a housing area (not on figure). (S/WN)

16. Pune Explosives R&D Laboratory (Figure 13) conducts R&D of high explosives, propellants, and pyrotechnics for the military. The laboratory consists of a propellant production area, a test area, a storage area, and an administration/engineering area. (S/WN)

17. Kirkee Ordnance R&D Facility ARDE (armaments, research, and development establishment; Figure 14) also conducts the R&D and testing of armaments, explosives, and guided missiles for the military. This facility, 1 nm east of the Pune Laboratory, consists of an administration area, a design/engineering area, a test area, and a support area. (S/WN)

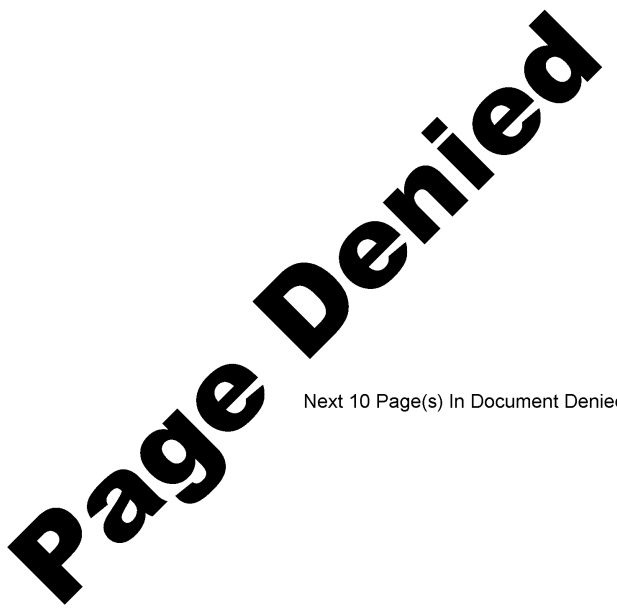
18. Sri Harikota Rocket Motor Test Facility, on the northern end of Sri Harikota Island, conducts development and testing of rocket motors for the space program. The plant consists of a rocket motor test area (Figure 15) and a nondestructive test area (Figure 16). Facilities in the rocket motor test area include two revetted horizontal static test positions, one revetted drop test position, one vibration test building, one small liquid engine test stand, and one acceleration test position. Both horizontal test positions have high- and low-capacity test cells. In addition, just north of the horizontal test positions, a large probable vertical assembly/test building has been under construction since early 1981. This construction is probably related to the ASLV and PSLV programs. Facilities in the nondestructive test area include two probable environmental test buildings, one high-altitude test building, and one probable maintenance/checkout building. (S/WN)

19. The Vikram Sarabhai Space Center (VSSC) at Thumba Missile and Rocket Test Site VSSC on India's southwest coast is India's primary space research center (Figure 17). The Thumba complex consists of the Space Science and Technology Center, a rocket fabrication area, a rocket propellant production area, a rocket fuel area, an SLV R&D/test area, a static test area, a rocket launch area, a tracking/telemetry area, a test and evaluation area, an administration and housing area, and a probable associated area. Thumba is involved in all Indian SLV programs, including production and testing of solid-propellant rocket fuel, and R&D of liquid engine fuel. SLV-3 mockup components have been observed at a probable environmental/structural test building in the SLV R&D/test area (Figure 18). PSLV mockup components were identified at Thumba for the first time in early 1984 (Figure 19). The zero gravity of outer space is simulated at the zero gravity simulation tower in the SLV R&D/test area (Figure 20). (S/WN)

Space Launch Facilities

20. Sri Harikota Space Center (Figure 21) is India's principal launch facility for SLVs and sounding rockets. The center includes Sri Harikota Space Launch Facility, Sri Harikota Space Launch Facility North, Sri Harikota Propellant Plant SPROB, Sri Harikota Rocket Motor Test Facility, Sulurpet Ground Telemetry Satellite Tracking Station [redacted] Sri Harikota Island Tracking Facility [redacted], Sri Harikota Domestic Satellite and Satellite Tracking Station [redacted], Sri Harikota Sounding Rocket Launch Facility [redacted], Sri Harikota Complex Control Centre [redacted] and a housing and support area. (S/WN) 25X1 25X1 225X1

21. The Space Launch Facility, on the south side of Sri Harikota Island, consists of a launch area, a launch support area, and a rocket motor storage area. The launch area includes one launch pad for the SLV-3, one small launch pad for sounding rockets, one launch control bunker, and one two-bay horizontal rocket assembly/checkout building (Figure 22). Construction began in early 1983 on a third launch pad that will probably support the ASLV program. The Indian press reported that the new pad will be completed during 1985. (S/WN)



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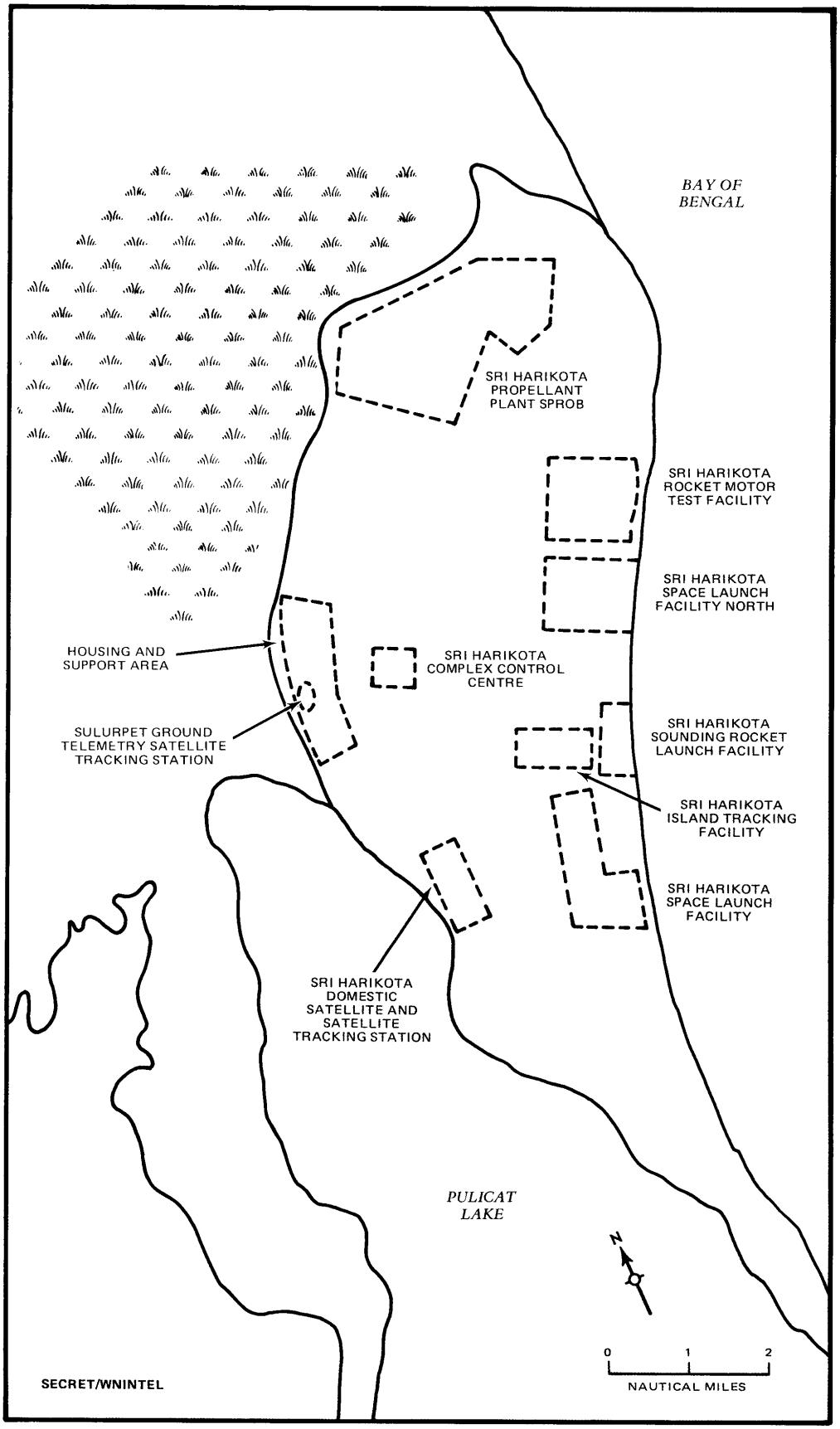

FIGURE 21. LOCATIONS OF FACILITIES AT SRI HARIKOTA SPACE CENTER

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22. Construction began on a new launch complex on Sri Harikota Island in late 1983 (Figure 23). This new area, Sri Harikota Space Launch Facility North, will probably be for the PSLV. Thus far, only a road pattern has been graded, probably for the launch area and the support area. The Indian press reported that the new complex is scheduled to be completed by 1988. (S/WN)

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MAPS OR CHARTS

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